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NOTES ON GEOGRAPHIC DISTRIBUTION

Distribution extension for *Anolis gruuo* Köhler, Ponce, Sunyer and Batista, 2007 (Reptilia: Squamata: Dactyloidae) in the Comarca Ngöbe-Buglé of western Panama, and first records from Veraguas province

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ABSTRACT: We report on new localities for *Anolis gruuo* Köhler, Ponce, Sunyer and Batista, 2007 along the Serranía de Tabasará in the Comarca Ngöbe-Buglé and Veraguas province of western Panama. These records extend the known geographic distribution of this lizard about 80 km eastward, and the known vertical distribution approximately 40 m lower and 630 m higher. We provide photos of specimens from different localities and comment on their morphology. Only the easternmost populations of this Panamanian endemic live inside a protected area.

Köhler *et al.* (2007) described *Anolis gruuo* on the basis of four specimens from "near the headwaters of Río San Félix, ca. 2 km N Escopeta Camp, ca. 08°32'N, 81°50'W, Serranía de Tabasará, 900 m elevation, Comarca Ngöbe Bugle, Distrito de Nole Düima, Corregimiento de Jadeberi, Panama." The type locality (Figure 1, locality 1; Figure 3A and B) is situated on the Pacific (*i.e.,* southern) slope of the Serranía de Tabasará, which constitutes the eastern continuous (unbroken above 1000 m) part of the Cordillera Central of western Panama. At the time of their morphological revision of *A. gruuo* and other Panamanian highland anoles related to *A. kemptoni* Dunn, 1940 (Ponce and Köhler 2008), still only the type series was available. During recent field work in the highlands of western Panama, we collected 23 additional specimens of *A. gruuo* from several localities east of the type locality that considerably improve our knowledge of the distribution and morphological variation of this little-known species.

All specimens were encountered during opportunistic searches performed primarily at night, captured by hand, and preserved the day after capture. The collecting permits SE/A-30-08, SC/A-8-09, SC/A-28-09, and SC/A-21-10, as well as the corresponding exportation permits, were issued by the Directorate of Protected Areas and Wildlife of the National Environmental Authority (Dirección de Áreas Protegidas y Vida Silvestre, Autoridad Nacional del Ambiente - ANAM), Panama City, Panama. Our specimens have been deposited in the collection of the Senckenberg Forschungsinstitut Frankfurt (SMF) and in the Museo Herpetológico de Chiriquí (MHCH) of the Universidad Autónoma de Chiriquí, Davíd, Chiriquí, Panama. Species identification was carried out employing the keys, figures, and descriptions provided by Köhler *et al.* (2007), Ponce and Köhler (2008), and Köhler (2008), and by comparison with the type series (SMF 85416–19). All specimens strongly resemble the type specimens of *Anolis gruuo* and match the descriptions in Köhler *et al.* (2007) and Ponce and Köhler (2008), in terms of external morphology and dewlap coloration. Adult specimens were sexed according to dewlap size and coloration, by evertion of hemipenes in males, and by presence or absence of enlarged postcloacal scales, the last also applicable to juveniles. Characters of external morphology were recorded according to the methodology described by Köhler *et al.* (2007) and Ponce and Köhler (2008). Snout-vent length (SVL) and tail length (TL) were measured using a ruler. Head length (HL), Head width (HW), snout length, and shank length measurements were made using calipers. Measurements and scale counts are summmarized in Table 1. Colors and color codes (the latter in parentheses) provided for referenced specimens follow those of Smithe (1975–1981). Coordinates and elevation were recorded using Garmin GPS receivers with built-in altimeters. All coordinates are in WGS 1984 datum; elevations are rounded to the nearest 10 m. Within the Comarca Ngöbe-Buglé, place names typically are in Ngäbere, the indigenous language of the Ngöbe people for which different spellings are available and used. For these names, we follow the spelling used on the Mapa General de la República de Panamá and in the Atlas Nacional de la República de Panamá (IGNTG 2000; 2008).

Figure 1 shows the type locality of *Anolis gruuo* and the localities reported herein. From west to east, we provide the following new records for *A. gruuo:*

Approximately 4.4 km N of Hato Chamí (Figure 1, locality 2; Figure 3C), in the valley of a small stream just west of the road from Hato Chamí to Cerro Colorado, Corregimiento de Jädeberi, Distrito de Nole Duima, Comarca Ngöbe-Buglé (08°29'16" N, 81°46'10" W, 1430–1450 m), AH and SL

collected four specimens (SMF 91461–3, MHCH 2161) on 26 June 2010.

Eleven specimens were collected during a joint field trip of AB, AH, MP, and SL to the vicinity of Buabidí (Figure 1, localities 3–5; Figure 3D–F), Corregimiento de Peña Blanca, Distrito de Müna, Comarca Ngöbe-Buglé. This settlement of difficult access is denoted as the capital of the Comarca Ngöbe-Buglé on most maps, and is also known as Buapití, Buäbti, Llano Tugrí, Alto Tugrí, and Hato Tugrí. On 23 March 2009, nine specimens (MHCH 1315–1318, 2159, 2160, SMF 89710–12) were found around a pond ("la laguna"; Figure 1, locality 3) about 2 km WNW of the communal buildings of Buabidí (08°29'08" N, 81°43'43" W, 1310 m). The same night one specimen (SMF 89709) was collected 1 km W of Buabidí (Figure 1, locality 4), about halfway on the trail to the aforementioned pond (08°28'55" N, 81°43'15" W, 1250 m). Another individual (SMF 89713) was encountered on 25 March 2009, 2.1 km NNW of Buabidí (Figure 1, locality 5), along the trail to Río Rey near the crossing of Quebrada Ardilla (08°29'47" N, 81°43'13" W, 1530 m).

In a ridgetop forest 1 km NNW of Guayabito (Figure 1, locality 6), Corregimiento de Guayabito, Distrito de Ñürün, Comarca Ngöbe-Buglé (08°32'54" N, 81°29'06" W, 1500 m), one adult male (SMF 91464) was collected on 01 August 2010.

Nine specimens were taken between Alto de Piedra (Figure 1, locality 7; Figure 3G) and the adjacent ridge of Cerro Mariposa (Figure 1, locality 8; Figure 3H), all between 3.3 and 3.9 km east of the boundary of Veraguas province, Corregimiento de Santa Fé, Distrito de Santa Fé, Provincia de Veraguas, by different collectors as follows: SMF 89469 by AH and SL on 29 May 2008, 08°30'51" N, 81°07'16" W, 900 m; MHCH 2162–2163 by AH and SL on 07 August 2010, 08°30'58" N, 81°07'07" W, 880 m; SMF 89470 by NH and LS on 09 July 2008, 08°30'03" N, 81°07'06" W, 1220 m; SMF 89471 by NH and LS on 01 August 2008, 08°31'03" N, 81°07'04" W, 860 m; SMF 90104 by SL on 25 October 2009, 08°30'00" N, 81°07'01" W, 1260 m; SMF 89468 by NH and LS on 27 May 2008, 08°30'52" N, 81°07'01" W, 860 m.

The localities reported herein extend the known geographic and elevational range of *Anolis gruuo*. Cerro Mariposa at Alto de Piedra, approximately 80 km east of the type locality, now constitutes the easternmost locality reported for the species and extends its distribution into Veraguas Province. The juvenile female SMF 89713 was collected near Quebrada Ardilla at 1530 m, which is the highest elevation reported so far for this species, followed by the adult male SMF 91464, collected near Guayabito at 1500 m. The females SMF 89468 and 89471, collected around Alto de Piedra in Veraguas at 860 m, now constitute the lower elevational limit for *A. gruuo.*

We suspect that *Anolis gruuo* has actually been collected previously in western Veraguas, but misidentified. Martínez and Rodríguez (1994) reported *A. cupreus* from "Cerro Tute" (= Cerro Mariposa), and Martínez *et al.* (1995) reported this species from the nearby Cerros Narices and Anselma. However, *A. cupreus* does not occur farther south than central Costa Rica (Köhler 2008). Unfortunately, their specimens have been lost (V. Martínez personal communication). Among the anoline species known from the Santa Fé area (Martínez and Rodríguez 1994; Martínez *et al.* 1995; Carrizo 2010; Stadler 2010), *A. gruuo* is most similar to *A. cupreus* and we suspect that the reports of *A. cupreus* are actually of *A. gruuo.*

Selected specimens are shown in Figure 2A–N. The examination of our additional specimens allows for a more

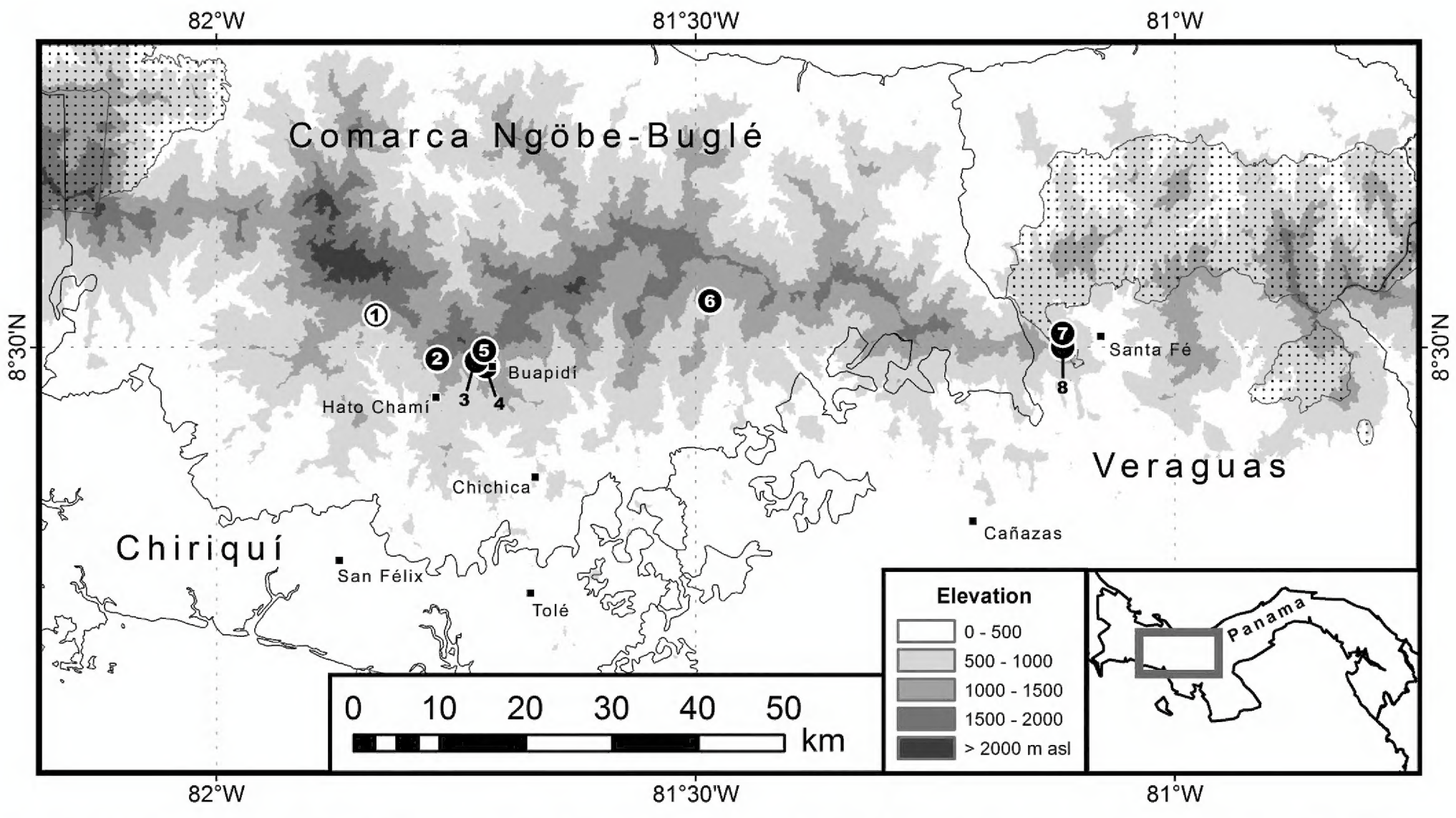

Figure 1. Distribution map showing the known localities for *Anolis gruuo* along the Pacific slopes of the Serranía de Tabasará in western Panama: The white circle (1) represents the type locality, black circles the localities 2–8 reported herein, with both 7 and 8 representing several adjacent localities. Relevant settlements are indicated by squares, protected areas are stippled.

comprehensive assessment of the variation in external morphology. Most notably, the maximum SVL is raised to 52 mm for males and 51 mm for females. In Table 1, we provide an updated version of the table of Ponce and Köhler (2008) for selected morphological characteristics of *A. gruuo,* based on all known specimens except MHCH 1315–1318 (n=23).

As typical for anoles, the coloration among our specimens is rather variable. Especially noteworthy is that the conspicuously contrasting dark and pale banding

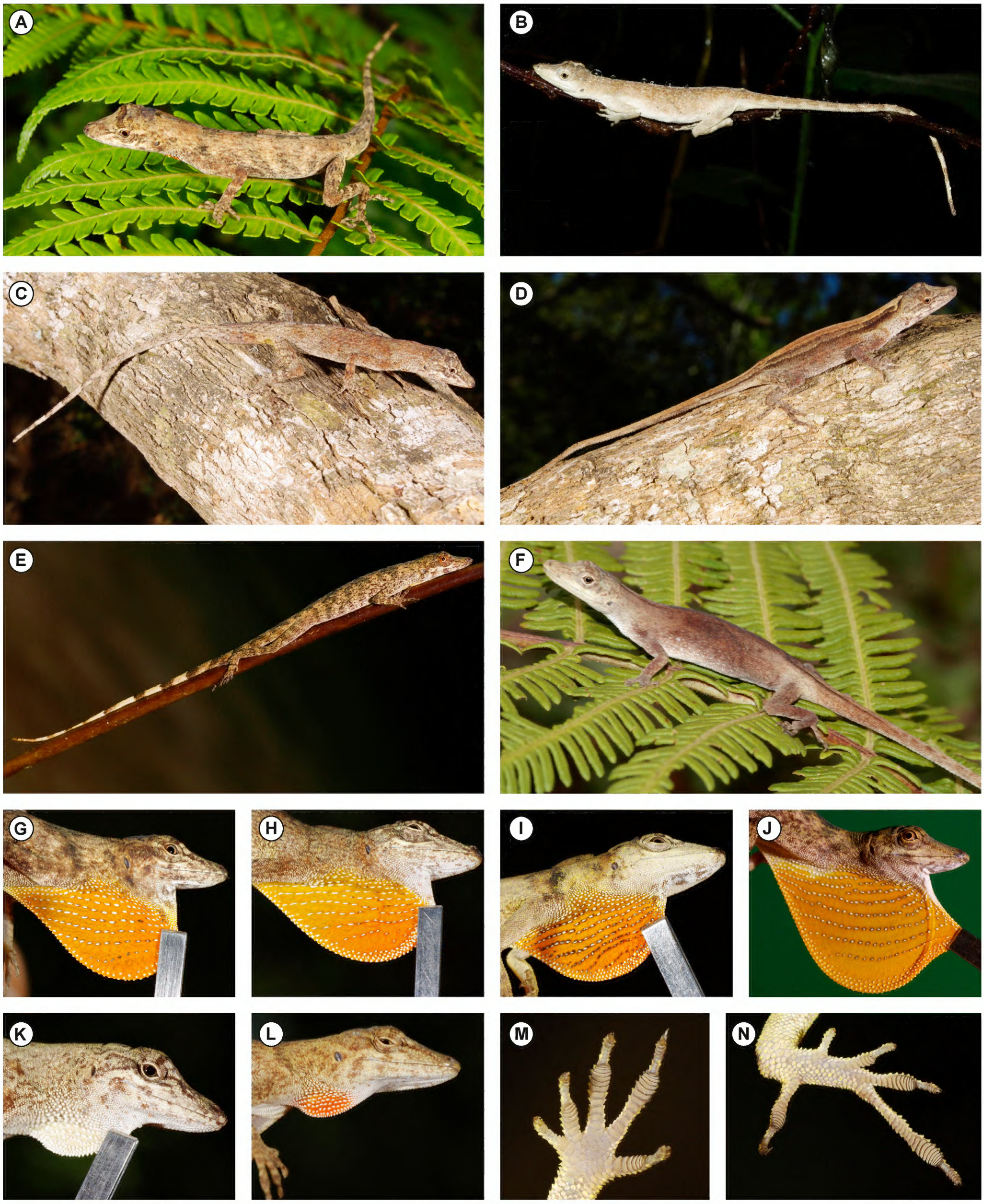

Figure 2. Individuals of *Anolia gruuo* from different localities: (A) male (SMF 91461) from north of Hato Chamí; (B) female (SMF 91462) from north of Hato Chamí in sleeping position; (C) male (SMF 89711) from near Buabidí; (D) female (SMF 89710) from near Buabidí; (E) male (SMF 89469) from Cerro Mariposa; (F) female (SMF 89471) from Alto de Piedra; (G)–(J) male dewlaps, width of forceps 3 mm: (G) SMF 91461; (H) SMF 89711; (I) SMF 91464 from north of Guayabito; (J) SMF 89469; (K)–(L) female dewlaps: (K) SMF 89712 from near Buabidí, adult; (L) MHCH 2160 from near Buabidí, subadult; (M) left hand and (N) left foot of SMF 91464 in ventral view (not to same scale).

of the tail, stated as a diagnostic character for *Anolis gruuo* (Köhler *et al.* 2007, Köhler 2008, Ponce and Köhler 2008), is not always evident in all specimens (*e.g.,* due to metachrosis according to the time of day or the nature of the situation), and in some even completely absent. Coloration of three specimens has been described by Stadler (2010). The following three paragraphs are a translation of these descriptions.

The coloration in life of an adult male (SMF 89469, Figure 2E and J) from Cerro Mariposa was recorded as follows: Dorsal ground color Grayish Olive (43), with Blackish Neutral Gray (82) mottling on dorsum and limbs and a broad middorsal stripe of the same color stretching from posterior part of upper head to anterior tail region; thereafter tail Grayish Olive (43) with contrasting transverse Blackish Neutral Gray (82) bands; chin dirty white with a darker white longitudinal stripe and Natal Brown (219A) flecks; venter dirty white with Natal Brown (219A) mottling; iris Tawny (38); dewlap Orange Yellow (18), gorgetals Dark Grayish Brown (20).

The coloration in life of an adult female (SMF 89470) from Cerro Mariposa was recorded as follows: Dorsal ground color Olive-Brown (28) with Olive-Yellow (52) mottling on limbs and anterior tail region; thereafter tail Olive-Brown (28) with contrasting transverse Olive-Yellow (52) bands; dorsal surface of head Olive-Brown (28) posteriorly, grading into a lighter Olive-Yellow (52) anteriorly and then into Olive-Brown (28) again on the snout; a Grayish Horn Color (91) interorbital bar; chin and venter dirty white, mottled with a mixture of Straw Yellow (56) and Citrine (51); ventral surface of tail Olive-Yellow (52); iris Kingfisher Rufous (240).

The coloration in life of another adult female (SMF 89471; Figure 2F) from Alto de Piedra was recorded as follows: Dorsal ground color Fuscous (21) suffused with Smoke Gray (45); a Fawn Color (25) longitudinal middorsal stripe stretches from posterior part of head to base of tail; thereafter tail Smoke Gray (45) with slight Fuscous (21) mottling; dorsal surface of head Smoke Gray (45) with Fuscous (21) mottling and a Citrine (51) interorbital bar; chin and snout region fade into Straw Yellow (56); venter dirty white, slightly speckled with Fawn Color (25) laterally; iris Kingfisher Rufous (240).

Almost all individuals were encountered at night, sleeping on vegetation between 0.4 and 4 m above ground. The only exception is SMF 89468, which was collected while it was active during heavy rainfall after dusk, about 0.3 m above ground on an ornamental plant in the restaurant at Alto de Piedra (center of Figure 3G). Our specimens come from habitats (compare photographs in

Table 1. Selected measurements, proportions and scale characters of 10 males and 13 females of *Anolis gruuo*. Range is followed by mean value and one standard deviation in parentheses.

CHARACTER	SEX	VALUE
Maximum SVL	males	52 mm
	females	51 mm
TL / SVL	males (n=7)	1.60–1.79 (1.67 ± 0.07)
	females (n=11)	1.46–1.75 (1.65 ± 0.10)
Tail diameter vertical / horizontal	males (n=9)	1.15–1.41 (1.25 ± 0.09)
	females	1.07–1.29 (1.19 ± 0.07)
Axilla-groin distance / SVL	males	0.40–0.45 (0.43 ± 0.02)
	females	0.42–0.47 (0.44 ± 0.02)
HL / SVL	males	0.25–0.27 (0.26 ± 0.01)
	females	0.24–0.28 (0.26 ± 0.01)
HL / HW	males	1.61–1.89 (1.71 ± 0.08)
	females	1.59–1.77 (1.65 ± 0.06)
Snout length / SVL	males	0.11–0.13 (0.12 ± 0.01)
	females	0.11–0.13 (0.12 ± 0.01)
Snout length / HL	males	0.45–0.50 (0.47 ± 0.02)
	females	0.45–0.50 (0.47 ± 0.02)
Shank length / SVL	males	0.21–0.37 (0.24 ± 0.05)
	females	0.18–0.25 (0.21 ± 0.02)
Shank length / HL	males	0.81–1.45 (0.92 ± 0.19)
	females	0.74–0.97 (0.82 ± 0.06)
Subdigital lamellae under phalanges II–IV of 4th toe		20–28 (24.26 ± 2.02)
Number of scales between supraocular semicircles		0–4 (1.17 ± 1.07)
Number of scales between interparietal and supraocular semicircles		1–5 (2.78 ± 1.09)
Number of scales between suboculars and supralabials		0
Number of supralabials to level below center of eye		7–9 (7.87 ± 0.63)
Number of infralabials to level below center of eye		6–9 (7.74 ± 0.92)
Total number of loreals		28–73 (40.52 ± 10.46)
Number of horizontal loreal scale rows		4–7 (5.04 ± 0.88)
Number of postrostrals		6–10 (7.87 ± 1.25)
Number of postmentals		5–8 (6.09 ± 0.51)
Number of scales between nasals		6–9 (7.26 ± 0.69)
Number of scales between 2nd canthals		7–13 (9.52 ± 1.70)
Number of scales between posterior canthals		9–15 (11.09 ± 1.78)
Number of medial dorsal scales in one HL		42–57 (48.86 ± 4.27)
Number of medial ventral scales in one HL		37–48 (42.77 ± 3.35)

Fig. 3A–H) ranging from roadsides, gardens, plantations, and secondary forest to apparently pristine cloud forest. However, apart from this variety of documented habitats, *Anolis gruuo* seems to be dependent on the presence of at least some tree cover, and thus is probably absent from the almost treeless savannas that cover a considerable portion of the Pacific slopes of the Serranía de Tabasará.

The known range of *Anolis gruuo* stretches over 80 airline km from 81°07'W to 81°50'W at premontane elevations between 860 and 1530 m along the Pacific

Figure 3. Habitats of *Anolis gruuo* along the Serranía de Tabasará in western Panama: (A) view over headwaters of Río San Félix, arrow indicates type locality at 900 m; (B) coffee plantation at type locality; (C) mixed vegetation along road to Cerro Colorado north of Hato Chamí, 1480 m; (D) looking north into the valley of Río Rey from the road leading to Buabidí at approximately 900 m; (E) forest along trail to Río Rey near Quebrada Ardilla; (F) looking east along the Serranía de Tabasará from Buabidí, 1240 m; (G) Restaurant at Alto de Piedra, 860 m, the easternmost and lowest locality for *A. gruuo*, with Cerro Mariposa in the background; (H) forest on Cerro Mariposa, 1280 m.

drainage of the Serranía de Tabasará, Cordillera Central, in western Panama. Future field work most probably will expand these range limits, but we do not expect this expansion to be too extensive. About 40 km west of the type locality begins the La Fortuna area within Reserva Forestal La Fortuna, while the area around El Copé within Parque Nacional General de División Omar Torijos Herrera lies some 50 km east of Alto de Piedra. Both areas have been extensively surveyed and it is is very unlikely that *A. gruuo* should have gone unnoticed. East of Alto de Piedra, the Cordillera Central drops well below 1000 m repeatedly, possibly constituting a physiographic barrier. Toward La Fortuna, *A. gruuo* might be replaced by *A. fortunensis,* which is known to occur there between 1000–1750 m (Köhler 2008; Lotzkat *et al.* 2010). The presence of *A. gruuo* on the Caribbean slopes might be suspected at least in the eastern portion of the Serranía de Tabasará, where several passes fall below the species' upper elevational limit. However, in the area between the type locality and Buabidí, we found *A. pseudokemptoni* instead of *A. gruuo* along the continental divide and on the Caribbean slopes.

Anolis gruuo is endemic to Panama, and probably restricted to the Serranía de Tabasará. We are convinced that, unlike other "no-longer-endemics," *e.g. Anolis datzorum* Köhler, Ponce, Sunyer and Batista, 2007, recently reported from Costa Rica (Köhler and Vargas 2010), *A. gruuo* will remain "endemic to Panama." This renders the Panamanian government entirely responsible for the conservation of this little lizard, just as for other reptile species that are endemic to the Serranía de Tabasará, namely *Anolis casildae* Arosemena, Ibañez and De Sousa 1991, *A. pseudokemptoni* Köhler, Ponce, Sunyer and Batista 2007, *A. pseudopachypus* Köhler, Ponce, Sunyer and Batista 2007, *Sibon perissostichon* Köhler, Lotzkat and Hertz 2010, and *Sibon* sp. nov. Lotzkat, Hertz and Köhler (in press). While only the easternmost populations of *A. gruuo* live inside a protected area, its extent of occurrence of just 386 km^2 and the continuing deforestation (resulting in a decline of the preferred shaded habitats) we observed in the region qualify *A. gruuo* for the IUCN category "Endangered" (EN) according to criterion B1b (IUCN 2001). Despite the unique biota of the Serranía de Tabasará, its natural habitats are seriously threatened with destruction owing to a desastrous socioeconomic setting. Most of this mountain chain falls within the indigenous autonomy territory Comarca Ngöbe-Buglé, where extreme poverty drives the growing population to increasingly exhaust the natural resources while legendary metal deposits and the potential for hydroelectric dams attract foreign exploitation interests (Nakoneczny and Whysner 2010). Serious conservation action should be undertaken in the central Serranía de Tabasará for a number of reasons, one of which is the existence of this endemic lizard within this area. Increased study of the herpetofauna and other biota of this region clearly is warranted.

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Literature Cited

Carrizo, A.R. 2010. *Riqueza y Abundancia de la Herpetofauna de la Cuenca Alta del Río Santa María, Santa Fe, Veraguas.* Davíd: Universidad Autónoma de Chiriquí. Accessible at http://www.senckenberg.de/files/content/forschung/abteilung/terrzool/herpetologie/herpetofauna_cuenca_alta_rio_santa_maria_veraguas_panama_carrizo_2010.pdf. Captured on 26 November 2011.

IGNTG. 2000. *Mapa General de la Republica de Panama 1:250 000. Edición 11.* Panamá: Instituto Geográfico Nacional "Tommy Guardia" (IGNTG) del Ministerio de Obras Públicas. 12 sheets.

IGNTG. 2008. *Atlas Nacional de la República de Panamá 2007.* Panamá: Instituto Geográfico Nacional "Tommy Guardia" (IGNTG) del Ministerio de Obras Públicas. xii+290 p.

IUCN. 2001. *IUCN Red List Categories and Criteria: Version 3.1.* Electronic Database Accessible at http://www.iucnredlist.org/documents/redlist_cats_crit_en.pdf. Captured on 14 June 2011.

Köhler, G. 2008. *Reptiles of Central America. Second edition*. Offenbach: Herpeton. 400 p.

Köhler, G. and J. Vargas. 2010. *Anolis datzorum* Köhler, Ponce, Sunyer and Batista, 2007, an addition to the known herpetofauna of Costa Rica. *Herpetozoa* 23(1/2): 95-98.

Köhler, G., M. Ponce, J. Sunyer and A. Batista. 2007. Four New Species of Anoles (Genus *Anolis*) from the Serranía de Tabasará, West-Central Panama (Squamata: Polychrotidae). *Herpetologica* 63(3): 375-391.

Lotzkat, S., A. Hertz and G. Köhler. 2012. A new species of *Sibon* (Squamata: Colubroidea: Dipsadidae) from the Cordillera Central of western Panama, with comments on other species of the genus in this area. *Zootaxa*: in press.

Lotzkat, S., A. Hertz, L. Stadler, N. Hamad, A.R. Carrizo and G. Köhler. 2010. Noteworthy Distribution Records records of Reptiles from Western Panamá. *Herpetological Review* 41(4): 520-523.

Martínez, V.C., N. Pimentel and A. Hurdaneta. 1995 "1994". Diversidad herpetofaunistica en los cerros "Narices" y "La Anselma": Provincia de Veraguas. Distrito de Santa Fe. *Scientia (Panamá)* 9: 59-79.

Martínez, V.C. and A. Rodríguez. 1994 "1992". Del primer inventario en "Cerro Tute". Amphibia: Caudata y Anura. Reptilia: Squamata. Sauria y Serpentes. *Scientia (Panamá)* 7: 29-53.

Nakoneczny, L. and K. Whysner. 2010. *In the "Heart" of the Comarca: Understanding the Environmental and Social Impacts of Mining the Cerro Colorado Deposit. ENVR451 Final Report. Prepared for Centro de Incidencia Ambiental, the Smithsonian Institute, McGill University and the communities of the Ngöbe-Buglé Comarca.* Panama City: Centro de Incidencia Ambiental (CIAM). Accessible at http://www.mcgill.ca/files/pfss/Understandingtheenvironmentalandsocialimpact.doc. Captured on 31 March 2011.

Ponce, M. and G. Köhler. 2008. Morphological variation in anoles related to *Anolis kemptoni* in Panama. *Salamandra* 44(2): 65-84.

Smithe, F.B. 1975–1981. *Naturalist's Color Guide. Part I. Color Guide. 182 Color Swatches.* New York: American Museum of Natural History.

Stadler, L. 2010. Diversität, Taxonomie und Zoogeographie der Herpetofauna der Umgebung von Alto de Piedra (Veraguas, Panama). Gießen: Justus-Liebig-Universität,. Accessible at http://www.senckenberg.de/files/content/forschung/abteilung/terrzool/herpetologie/herpetofauna_alto_de_piedra_veraguas_panama_stadler_2010.pdf. Captured on 26 November 2011.

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